SUPPORT GRID SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of United States Provisional Application Serial No. 60/271,660, filed February 26, 2001, which is incorporated herein in its entirety by reference.

FIELD OF THE INVENTION

The present invention generally relates to a support grid system and more specifically to a system comprising a bracing attachment clip to aid in providing resistance to a wind up-lift force.

BACKGROUND

Ceilings typically can be comprised of a system of panels or formed from drywall sheeting. Preferably, ceilings exposed to the elements are designed to withstand various environmental conditions. The two most common environmental conditions are rain and wind. Ceilings comprised of drywall or formed from panels having a moisture sensitive binder such as starch are the most sensitive to rain while ceilings formed from corrosive resistant metal panels are the least sensitive to moisture.

However, the opposite is true for wind resistance. Ceilings formed from sheets of drywall have considerable bridging and resistance strength as compared to ceilings formed from metal panels. Once a drywall sheet has been screwed into a support grid,

the drywall sheet stabilizes the whole system and helps distribute the load. In a ceiling comprised of metal panels there is no such bridging and resistance strength.

Thus, metal panels are especially vulnerable to uplifting forces caused by strong winds such as in the case of hurricanes. Panels can break free of the support grid system and become flying projectiles capable of causing injury to persons or property. In response to such dangers many communities require that exterior ceiling applications meet an up-lift capability of Class 90.

The support grid of a paneled ceiling can be strengthened to help meet up-lift restrictions and to prevent panels from becoming projectiles in a wind storm. One method used to strengthen the support grid includes the use of compression posts attached to both the building structure and the support grid. The compression posts are notched to come down around the bulb of the grid and are typically nailed to the truss system of the roof. Unfortunately, the precision cut required to form a notch that can fit around the bulb part of the grid is very difficult to make and requires extreme care since there is very little tolerance in the cut.

While the use of compression posts is an effective mechanism for preventing up-lift, the current method of installation is both expensive and time consuming. Thus, what is needed is a compression post method of attachment that is both quick and inexpensive.

SUMMARY

The present invention includes a ceiling system capable of meeting a wind up-lift capability of at least Class 90 or greater. Additionally, further embodiments are provided meeting wind up-lift requirements of at least Class 60 or greater and at least Class 30 or greater. The ceiling system includes a grid formed from a plurality of parallel-extending main runners having a plurality of cross runners extending between the main runners. The grid can be suspended from and attached to a ceiling using a plurality of compression struts perpendicular to the ceiling. A bracing attachment clip is attached to a runner and a compression strut. The clip essentially comprises a first and second leg and a mid-portion. The first leg secures the clip to a runner and the second leg secures the clip to an adjoining compression strut. The mid-portion of the clip conforms to the bulb portion of the runner. The attached clip is designed to prevent the grid main runners from rotating away from the compression posts. The clip provides positive engagement of the main runner bulb and the compression post.

The system aids in the prevention of grid main runner rotation and vertical lift which takes place when the system is subjected to strong wind forces. The clip can be positioned about every 2 feet on the main beam to meet a 90 classification. The spacing may be an even fraction of about 12 feet since most runners are 12 feet in length. The clip may be positioned across the runner splice to strengthen the splice against twisting.

A further embodiment includes a support member for a support grid having a main runner having a bulb portion. Typically, the main runner has the form of an

inverted "T". A clip having a mid-portion disposed between two legs is attached to the main runner by one of the legs. Additionally, the mid-portion is substantially shaped to conform to the bulb of the main runner.

An additional embodiment includes a clip for attaching a main runner to a compression strut. The clip includes at least two ends which connect a compression strut and a main runner. The clip also has a mid-section that fits partially around the bulb portion of the main runner.

DESCRIPTION OF THE DRAWINGS

In the drawings:

Figure 1a is a schematic view of the clip attached to the main beam;

Figure 1b is a schematic view of the back of the clip attached to the main beam and compression strut;

Figure 1c is a schematic view of the clip attached to the main beam and the compression strut attached to a truss;

Figure 2 illustrates various views of the clip; and

Figure 3 illustrates the grid structure, clip and strut.

DETAILED DESCRIPTION

The present invention provides for a ceiling system comprising a grid formed from a plurality of parallel-extending main runners having a plurality of cross runners extending between the main runners. A plurality of compression struts are attached to the grid and a clip is secured to the main runner and the compression strut.

The clip aids in providing a wind up-lift capability up to Class 90 for the ceiling system. The clip may be made of most any material that is resilient enough to provide the stability required for the desired up-lift capability. The clip may be comprised of a metallic composition and typically steel. The clip may also be formed from a polymeric material or engineered composite. The clip is fastened to the compression post and main runner typically by screws. Of course other fastening means may also be used such as rivets.

The clip 2 can be placed across a runner splice. When the clip 2 is placed across the splice the clip 2 provides added strength. One configuration of the clip 2 includes half of the clip leg attached to one runner and the other half attached to a second runner. The clips may also be placed at various desired intervals depending upon the up-lift strength desired and the strength or gauge of runners. For example, the clip 2 can be positioned about every 2 feet on the main beam to meet a 90 classification. The spacing may be an even fraction of about 12 feet, since most runners are 12 feet in length. Of course, lower classifications, such as 60, can be met with wider spacings.

In greater detail, the clip 2 may be made of 18 gauge hot dipped galvanized steel with a zinc coating level of G60. The clip 2 can be formed from stamped steel blank and drilled to add pilot holes. The pilot holes maintain the screw placement accuracy and the integrity of attachment to the grid. The clip 2 physically wraps around the bulb 14 of the grid and after securing the clip to the main runner with screws, becomes an integral part of the grid system.

The panels are typically installed as downward access panels. The panels may also be installed as upward access, but for ease of use and clearance, the downward access panels are typically employed. The panels may be comprised of most any material suitable for the environment in which the ceiling is to be installed. An example panel is typically comprised of metal or alloy. Such panels provide both strength and durability. The panels may also have an edge configuration to prevent the panel from being dislodged by an up-lift draft. In greater detail, the panels are attached to the grid such that they are held in place and are not easily dislodged from the facing side of the ceiling or upward side. The panels are downwardly accessible, wherein the panels may be removed from the grid on the plenum side or the backing side of the panel. Examples of locking mechanisms that may be used to secure the panels in place are further illustrated in U.S. Patent Nos. 5,417,025 and 5,355,646, all of which are incorporated herein in their entirety by reference.

Turning to the figures, in Figures 1a-c the clip 2 is illustrated attached to the main beam 10 by two sets of self drill screws. It is to be understood that the clip may be

attached to the main beam 10 and compression strut 12 by any means, such as rivets, adhesives, bolts, or other mechanical or chemical fastening devices. The mid-section 8 of the clip 2 fits over the bulb 14 portion of the main beam 10 to hold the main beam 10 securely in place against the compression strut 12.

Figure 2 illustrates an embodiment of the clip 2. The clip 2 has a first end 6 and a second end 4. The ends may have at least one hole for fastening the clip 2 to both the main beam and the compression strut via the respective ends. The mid-section 8 has a ridge or indentation that approximates the bulb portion 14 of the main beam 10. Thus, the bulb portion 14 of the main beam 10 may fit within the mid-section 8 of the clip.

Figure 3 illustrates an embodiment of the ceiling system comprising the clip 2, main beam 10, compression strut 12 and the cross beams forming a grid wherein a panel, not illustrated, may rest within the grid opening.

The following example is intended to illustrate the invention and it is thought variations will occur to those skilled in the art. Accordingly, it is intended that the scope of the invention should be limited only by the appended claims.

Example

Described below are the test procedures and the results for an up-lift resistant ceiling assembly according to the present invention.

A test specimen was prepared measuring 10-foot square, and was tested in accordance with Underwriters Laboratories, Inc. UL 580 Standard for Safety, *Tests for*

Uplift Resistance of Roof Assemblies. This test simulates the effects of wind gusts by use of oscillating exterior pressure and constant interior pressures. The UL 580 standard provides a rating system to evaluate the comparative wind resistance of roof assemblies. Chart 1 illustrates the UL 580 load table test pressures.

The ceiling system was installed into the 10-foot square opening created by the test frame and nominal 4" by 4" diameter lumber. Ceiling tile system fasteners included wafer-head streaker screws secured to the perimeter angle and studs, Hex-head self-drilling #8 x ¾" long secure the stud hanger to main runners and cross t's.

The peripheral support test apparatus frame was fabricated from C15 by 33.9 steel channels having a dimension of 10'0" wide by 10'0" long by 1'3" deep. Two chambers were welded together forming a 30" deep chamber to provide simulated roof trusses. Nominal 4" x 4" wood members were installed to the base of the steel channel frame. The test results essentially indicated no visible damage for all the classes tested.

CHART #1

UL 580 Load Table Test Pressures

		Negative Pressure		Positive Pressure	
Test Phase	Time Duration, Minutes	Pounds Per Square Foot psf (kPA)	Inches (mm) of Water	Pounds Per Square Foot psf (kPa)	Inches (mm) of Water
Class 30					
1	5	16.2 (0.79)	3.1 (79)	0.0 (0.00)	0.0 (0)
2	5	16.2 (0.79)	3.1 (79)	13.8 (0.66)	2.7 (69)
3	60	8.1-27.7 (0.39-1.33)	1.5-5.3 (38-135)	13.8 (0.66)	2.7 (69)
4	5	24.2 (1.16)	4.7 (119)	0.0 (0.00)	0.0 (0)
5	5	24.2 (1.16)	4.7 (119)	20.8 (1.00)	4.0 (102)
Class 60					
1	5	32.3 (1.55)	6.2 (157)	0.0 (0.00)	0.0 (0)
2	5	32.3 (1.55	6.2 (157)	27.7 (1.33)	5.3 (135)
3	60	16.2-55.4 (0.79-2.66)	3.1-10.7 (79-272)	27.7 (1.33)	5.3 (135)
4	5	40.4 (1.94)	7.8 (198)	0.0 (0.00)	0.0 (0)
5	5	40.4 (1.94)	7.8 (198)	34.6 (1.66)	6.7 (170)
Class 90 (maximum combined up-lift pressure of 105 psf)					
1	5	48.5 (2.33)	9.3 (236)	0.0 (0.00)	0.0 (0)
2	5	48.5 (2.33)	9.3 (236)	41.5 (1.99)	8.0 (203)
3	60	24.2-48.5 (1.16-2.33)	4.7-9.3 (119-236)	41.5 (1.99)	8.0 (203)
4	5	56.5 (2.71)	10.9 (277)	0.0 (0.00)	0.0 (0)
5	5	56.5 (2.71)	10.9 (277)	48.5 (2.33)	9.3 (236)

It will be understood by those skilled in the art that while the present invention has been disclosed above with reference to preferred embodiments, various modifications, changes and additions can be made to the foregoing invention, without departing from the spirit and scope thereof.